Smart Power Infrastructure Demonstration for Energy Reliability and Security (SPIDERS) Joint Capabilities Technology Demonstration (JCTD) Transition Opportunities within DOD

June 18, 2013

Bill Anderson, P.E.
aka *California Trapdoor Spider*
SPIDERS Transition Manager

CAMP LEMONNIER SPIDERS TRANSITIONAL OPPORTUNITY

- **OPPORTUNITY**
  - Highest electrical generation costs
  - Critical Infrastructure
  - Renewables: Solar and Geothermal
- **CHALLENGES**
  - Climate
  - Local utility limitations
  - Spot power generators
  - Uncertainty of future
- **SOLUTIONS**
  - Immediate
  - Transitional
  - Long term
- **IMPLEMENTATION STRATEGY**
  - AMI & ICS
  - EMS
- **FOLLOW-ON TRANSITION OPPORTUNITIES**
  - AFRICOM
  - PACOM

SPIDERS transitional opportunity at CLDJ delivers immediate benefit of smart cybersecure microgrid solutions

CRITICAL INFRASTRUCTURE, RENEWABLES, AND HEAVY ENERGY LOAD

- $0.43/kWh
- $22M electrical generation in FY12
- 1/3 of EURAFSWA's costs
- $44M projected FY14
- 100% diesel
- 6.8M gallons in FY12

CAMP LEMONNIER, DJIBOUTI – A WORTHY CHALLENGE

- Mission:
  - Provide a base of operations that enables tenant commands to perform their missions in the Horn of Africa region
- Plant Replacement Value: ~$400M
- Business Volume: $400M
- Uniqueness:
  - First Navy expeditionary base
  - Remote, harsh environment
- Base Size: ~500 acres
- Total Base Population: 2,860+
- Major Command: CJTF-HOA
- Current on site PWD Size: 29

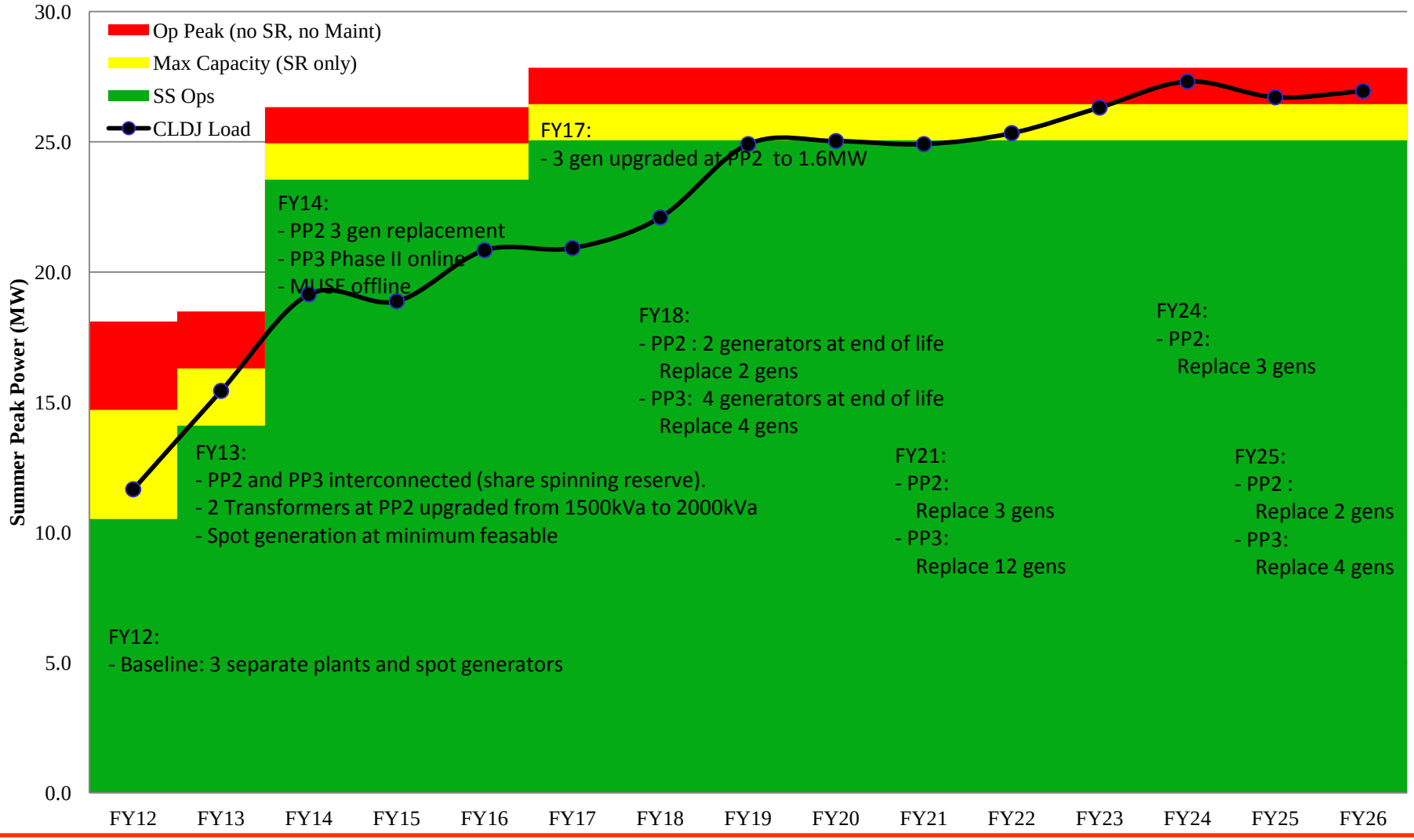
PRIME POWER GENERATORS

- 18 prime power generators
- Nameplate capacity: 25 MW
- De-rated 27% to 18.3 MW
- Operated as three separate power plants
- All energy supplied via diesel generation
- Four sources: MUSE, PPII, PPIII, & Tactical Generators
- Efficiencies per gallon of diesel
  - Tac. Gens.: 4-7 kWh/gallon
  - MUSE: 11.0 kWh/gallon
  - PPII: 13.9 kWh/gallon
  - PPIII: 15.2 kWh/gallon

MULTIPLE CHALLENGES

- Hot: Average highs 30°- 41° C
- Remote: Naples, Italy is 3,700 km (Washington to Los Angeles)
- Extremely harsh climate: sun, wind, humidity, desolate … BRUTAL!
- Sand “piles-up” at optimal PV angle of ~11°...driving angle to be suboptimal at 30°+
- Uncertainity of future

INCREASING ENERGY CONSUMPTION



SPOT POWER GENERATORS

Major effort to reduce tactical generators in FY13

- Tactical generator fuel use FY12: $7.7 million
- At the start of FY13: 120 tactical generators
  - 75 operating and 45 backups
- As of April 1, 2013: 71 tactical generators
  - 49 generators were taken off line
  - 47 operating and 24 backups
  - Plan is to eliminate 24 more by end of FY13
  - 12 of the 47 operating generators are very light use – less than $25K/yr combined
  - Need a plan for remaining 35 generators

Estimated savings in FY 13: $1.3-$1.8 million

CLU-VILLE IS CAMP'S LARGEST LOAD

- Containerized Living Units (CLUs)
  - Relocatable buildings
  - 8' by 20' living space

>50% of base load is air conditioning

ENERGY SECURITY THROUGH MICROGRID SOLUTIONS

- **CLDJ is alone, by itself: "A self-serving microgrid"**
  - Island microgrid: Inherently provide energy security
  - Caveat: 100% reliance on diesel fuel is a security risk
- **How do we best address the energy needs of CLDJ?**

  - **Immediate solution:** AMI and EMS
  - **Transitional solution:** Microgrids with cybersecurity solutions
  - **Long term solution:** PPA with renewable investment using utility for prime and on base generation microgrid as backup (SPIDERS model)

IMPLEMENTATION STRATEGY

AMI
- Meters
- Network

ICS
- Incorporate DDC into AMI network
- Emphasize cybersecurity: CSET and CERT

EMS
- Leverage existing genset capabilities

Immediate benefits realized by adjusting gensets from being derated for prime power ratings continuous power

OBJECTIVE OF ENERGY SECURITY ASSESSMENT

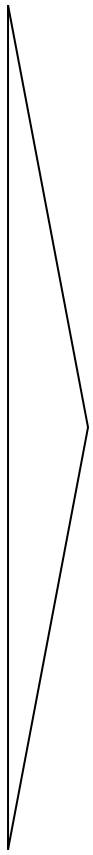
On April 29th - May 3rd, 2013 representatives from NAVFAC, USACE, and NREL* participated in a Net-Zero / Energy Reliability Site assessment for Camp Lemonnier Djibouti (CLDJ). The team's focus was the following:

- Assist CLDJ and NAVFAC EURAFSWA in continuing to develop an overall Energy Master Plan (currently being conducted through a contract with HDR).
- Assess opportunities for installation to become "Net-Zero".
- Assess energy efficiency and conservation opportunities.
- Assess the energy-reliability of the installation, including cybersecurity.
- Assist CLDJ in developing a sufficient metering plan.
- Assist CLDJ in reviewing future power plant expansion opportunities.

*DHS and INL remote support

FOLLOW-ON TRANSITION OPPORTUNITIES

- **AFRICOM**
  - Camp Simba
- **PACOM**
  - PMRF



SPIDERS solutions will continue to be transitioned to provide maximum operational and financial energy security benefits

QUESTIONS?

Bill Anderson, P.E.
SPIDERS Transition Manager
bill.anderson1@navy.mil